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Why Trout Anglers Should Care About Groundwater Pumping

~Robert Glennon, University of Arizona

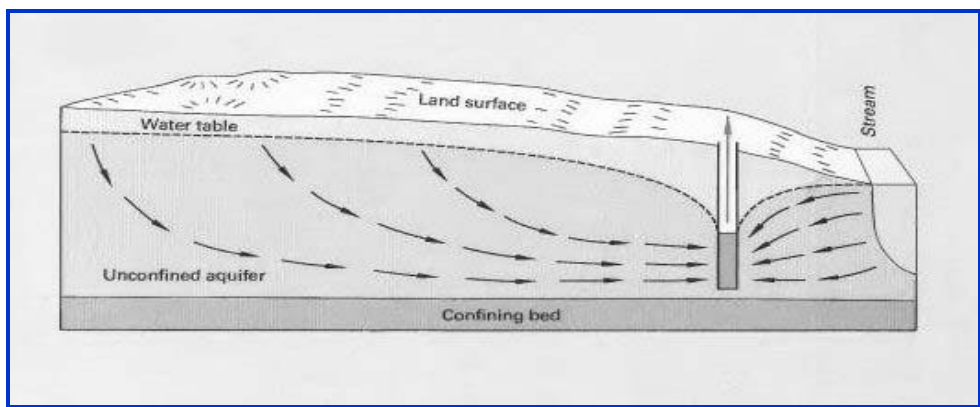
Wild Atlantic salmon in Maine, rainbow and brook trout in Wisconsin, brown trout in Minnesota and fall-run Chinook salmon in California share something in common: each is threatened by groundwater pumping. The environmental consequences of groundwater pumping are catastrophic: rivers, springs, lakes and wetlands have dried up, the ground beneath us has collapsed, and fish, birds, wildlife, trees and shrubs have died. Yet, the only people who know about this problem are a few scientists, a handful of water management experts, and those unfortunate enough to have witnessed it themselves.

Alas, the situation is getting worse. In the ongoing drought, cities, farmers, miners and individual homeowners, in search of new water supplies, have mostly turned to groundwater. Once thought to be as ubiquitous and plentiful as the air we breathe, we now know that groundwater is a finite resource, one that we are quickly and recklessly depleting.

To understand this pressing threat to some blue-ribbon trout waters, it's necessary to understand a bit of the science of hydrology. Ground and surface water are intimately connected in the hydrologic cycle. Rainfall and snowmelt indirectly provide water to lakes and rivers by percolating into the ground and then migrating laterally to reach a watercourse.

If this sounds strange, consider the following riddle: where does water in a

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A well intercepts water that would flow to a stream.

~USGS Circular 1139

river come from if it has not rained recently? It comes from groundwater. The onset of groundwater pumping disrupts this cycle by creating a “cone of depression” – a lowering of the water table in the vicinity of the well. If pumping continues, the cone may eventually grow so large that the well starts capturing water directly from the river. Even if the well is located some distance from the surface water, it indirectly causes harm by intercepting water moving toward the river.

Legal rules compound the problem by failing to limit the size and scope of groundwater wells. Imagine a groundwater aquifer as a giant milkshake glass, and each well as a straw in the glass. In most states, the law allows a limitless number of straws in a single glass. It’s a classic example of the tragedy of the commons, and it’s a recipe for disaster.

For trout anglers, the need to reform the system is urgent. Because groundwater moves slowly, years or even decades may pass before groundwater pumping lowers the flow in a river, reduces the level in a lake or increases the ambient water temperature. The hidden tragedy is that groundwater pumping that has already occurred will harm trout streams in the future. And as groundwater pumping increases, the consequences will become more severe.

Farming, ranching and rapid development consume massive quantities of groundwater in the West. But the problem isn’t confined to any one region of the country. Even relatively “wet” states like Massachusetts, Florida, Michigan, Wisconsin, California and Minnesota consume unsustainable amounts of groundwater to support population growth, suburban sprawl, a consumer craze for bottled “spring” water and the fast food industry’s demand for perfectly uniform French fries.

What can we do about this problem? Lots. We can get involved with a local group, such as a Trout Unlimited chapter. At the state level, we can break the relentless cycle of unlimited access to finite groundwater resources. Economic incentives can be a powerful tool to stimulate conservation and to reward those who conserve water with the right to sell some of it. Developers can be required to purchase and retire existing water rights. Simply put, we can no longer afford to allow unlimited new straws in the milkshake glass.

Finally, we must recognize the economic value of our water resources. Although water is a precious commodity, millions of Americans pay more each month for their cell phone and cable television than they do for

water. In fact, most Americans pay nothing for the water that they receive. Most water bills simply charge for the costs of the distribution of the water. Increasing the price we pay for water would encourage conservation and reduce the pressure to drill new groundwater wells that threaten some of our favorite trout waters.

Note: Excerpt from **Trout, The Journal of Coldwater Fisheries Conservation**, Summer 2004, with permission of Editor and Robert Glennon. Original article: “*Good to the Last Drop, Conserving the West’s Groundwater Resources*.” Robert Glennon is the Morris K. Udall Professor of Law and Public Policy at the University of Arizona College of Law. Learn more about ground water and French fries in his excellent book, “*Water Follies: Groundwater Pumping and the Fate of America’s Fresh Waters*,” Island Press, 2002.

Aquatic and Riparian Invasive Species in Region 8

~Toney Ott, EPA Region 8



An “invasive species” is defined as an alien species whose introduction is causing or is likely to cause economic or environmental harm, or harm to human health.

EPA scientists are increasingly concerned about aquatic and riparian invasive species affecting western ecosystems. In the past, most western state and federal invasive species programs have concentrated on species impacting agricultural, range and forestry lands. Terrestrial invasive plants such as leafy spurge and field bindweed have received much of the attention. State agencies are now beginning to report occurrences of aquatic and riparian invasive species, but usually only when they impact agriculture. Other areas of concern are forestry insects and disease, and riparian species that are characterized as utilizing high amounts of water, such as tamarisk. Invasive species management programs which emphasize aquatic species are gaining visibility and there is a growing recognition of the economic and environmental costs of aquatic nuisance species. The Western Governors’ Association Policy Resolution 02 - 21, *Undesirable Aquatic, Riparian, and Invasive Species*, emphasizes the need to address this

problem (see <http://www.westgov.org/wga/policy/04/invasives.pdf>).

Aquatic and riparian invasives impact the western US in a number of ways: economic health, human health, wildlife health and ecosystem health. Increased erosion, toxicity, water mining, shoreline instability, and biodiversity changes are examples of ecosystem stress caused by invasives.

The EPA Region 8 Consolidated Funding Program will soon have conditions requiring recipients of funds to help EPA comply with Executive Order 13112 (Invasive Species). Activities such as sampling and monitoring water bodies and wetland habitats, and any type of soil disturbance have the potential to allow invasives to get a foothold in the area of your project. Preventive actions such as thoroughly cleaning your equipment (including boats and boots) between monitoring sites, and monitoring your project for invasives will be required of grantees (see http://www.epa.gov/owow/invasive_species/EO13112.pdf).

EPA Region 8 is developing a list of major aquatic and riparian species of concern. It is based on lists from relevant state agencies in Region 8, neighboring state lists, the presence of the species in neighboring states, and federal lists. A number of other factors are being considered, including: local interest, probability of the invasive to become established within ecosystems in Region 8, ecosystem models, and the presence of a pathway of introduction. A preliminary list of major species of concern is provided below:

Aquatic and Riparian Species of Concern

water hyacinth	rusty crawfish
hydrilla	Brazilian elodea
Eurasian milfoil	silver carp
reed canarygrass	bighead carp
purple loosestrife	grass carp
water chestnut	bull frog
salt cedar	whirling disease
common reed	golden algae
New Zealand mudsnail	<i>Didymosphenia</i>
zebra mussel	<i>geminata</i>
quagga mussel	

A web page with information on EPA Region 8 activities, links to state web pages, and other reporting and informational sites will soon be available. In the meantime, see these web sites:

http://www.epa.gov/owow/invasive_species/
EPA's Office of Water invasive species website

<http://www.epa.gov/owow/watershed/wacademy/acad2000/invasive.html>
Watershed training module

<http://www.invasivespecies.gov>
Gateway to Federal efforts concerning invasives

<http://www.100thmeridian.org/>
The 100th Meridian Initiative is a cooperative effort between state, provincial, and federal agencies to prevent the westward spread of zebra mussels and other aquatic nuisance species in North America.

For more information, contact **Toney Ott**, at 303-312-6909 or ott.toney@epa.gov

Changes in Geographic Distribution and Occurrence of Algae ~Sarah Spaulding, USGS

Historically, *Didymosphenia geminata* was a rare and beautiful diatom (a type of single-celled algae) restricted to pristine lakes and streams of northern latitudes. In recent years, its reputation has changed. While the diatom is still lovely, it is no longer rare. *Didymosphenia geminata* now forms excessive growths in Boulder Creek, as well as many streams of Colorado and western North America.

Didymosphenia geminata attaches to the stream bottom by a slimy stalk. In some streams, the stalks of *D. geminata* cover almost all available substrates, forming dense mucilaginous mats up to several centimeters in length. The dense mats prevent the growth of other diatom species, which are an important source of food for aquatic invertebrates. Associated with increased populations of *D. geminata* is a decrease in abundance of aquatic invertebrates. In turn, the species and availability of invertebrates impacts fish that feed on them. State land managers are concerned about the negative impact of

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Didymosphenia geminata

~USGS

D. geminata on fisheries, especially given the spread of the diatom across watershed boundaries.

What has changed to allow *D. geminata* to take on the characteristics of an invasive species? Did the environment change, or did the ecological tolerance of *D. geminata* itself change? Connections between the features of the diatom (cell size, stalk composition), other organisms (mayflies, stoneflies, midge larvae), and the physical environment (stream flow, ultraviolet light, temperature) may play a role in explaining the dense growths of this diatom and its impacts at the watershed scale. These are some of the questions we are working to address. We need assistance in determining the current geographic distribution of this species.

Fisherman, boaters, and other recreational users are likely to see the growths of *D. geminata* beginning in early spring and extending through fall. The algal masses appear as a golden-brown fuzz on stream surfaces including rocks and aquatic plants. As the masses die, the stalks dry on to surfaces at the stream edge. The dry stalks are whitish in appearance, and many times people report seeing dried toilet paper on rocks because of the white, flaky appearance.

Excessive growths of *D. geminata* have recently occurred in several rivers in Colorado, including the Cache La Poudre, Frying Pan, Arkansas, and Blue Rivers. Please report locations of excessive *Didymosphenia geminata* growth to the email address below. For more information, contact **Sarah Spaulding** at 303-312-6212 or spaulding.sarah@epa.gov, or visit this web site: <http://www.epa.gov/region8/water/monitoring/didymosphenia.html>

Straight Creek Sediment Control ~Terri Tiehen, Colorado Department of Transportation

The Straight Creek watershed is located approximately 60 miles west of Denver in Summit County, Colorado. Straight Creek is a steep, high-elevation mountain stream located within the White River National Forest. At elevations between 9,000 and 13,000 feet above sea level, the watershed is subject to extreme weather conditions and significant snowfall. During the 1970's, Interstate 70 (I-70) was constructed through the area, traversing the Continental Divide with the completion of the Eisenhower Tunnel (Tunnel) in 1979.

The Tunnel is the highest vehicular tunnel in the world, located at over 11,000 feet above sea level. Straight Creek originates just north of the west portals of the Tunnel and flows through a culvert under I-70. From this location, Straight Creek parallels the Interstate and joins the Blue River, a Gold-Medal trout fishery, at the town of Silverthorne about eight miles below. Two downstream communities, Dillon and the Dillon Valley District, depend on Straight Creek for their primary drinking water supply.

Since the completion of I-70, sediment loading from exposed cut and fill slopes along the highway and sanding from winter maintenance operations has affected both fish habitat and local water plant operations. In 1991, the Straight Creek Clean-up Committee was formed to develop and implement remediation within the watershed and oversee the water monitoring program. Since that time, over \$11 million have been spent implementing Best Management Practices (BMPs) to curtail further sediment loading along this corridor.

Implementing BMPs along a major interstate highway, such as the Straight Creek corridor, is challenging, expensive and often requires an innovative approach. The difficult terrain, high altitudes, steep grades, adverse weather conditions, limited space, safety concerns and other factors can create problems. This is illustrated by three projects scheduled for construction during the summer of 2005. Funding for these projects is from the Clean Water Act (CWA) Section 319 grant program, and state and federal transportation funds. At a total cost of \$1.5 million, these projects involve a unique approach to BMP design.

The first of these projects is the ***Tunnel Sediment and Drainage Control*** project located at the west Tunnel approaches. This is a \$1 million project using federal and state highway funds through the Statewide Transportation Improvement Program (STIP). This project will essentially construct a new storm water drainage system that will collect highway runoff that is currently discharging into the culvert that carries Straight Creek underneath the highway. At the completion of the project, highway runoff near the west portal of the Tunnel will be diverted away from Straight Creek and directed into a nearby sediment basin. Straight Creek, which currently flows into the same sediment basin, will be rerouted and placed back into its original channel. This project will reduce contaminant loading to upper Straight Creek.

A CWA Section 319 grant approved in 2003 is paying for the ***I-70 Cut Slope Erosion and Traction Sand Structural BMP above Straight Creek***. This is a demonstration project located along westbound I-70 at milepost 212. The town of Dillon, Dillon Valley District and the Colorado Department of Transportation (CDOT) are providing the match funding for this \$250,000 project. The BMP is a “*clean water diversion*,” in which a perforated drainage pipe will be imbedded in gravel and placed behind a concrete barrier. The purpose is to separate groundwater spring flows from highway runoff flows. The water will be diverted to the nearest clean water tributary culvert. Currently, clean tributary flows mix with the highway runoff that goes to inlets and culverts along the



Aerial view of the Straight Creek Valley, West of Eisenhower Tunnel

~CDOT Archives

highway. Some of these flows pass through existing sediment basins located at the bottom of the fill slopes. As a result, the efficiency of the basins is greatly reduced and the clean water can become contaminated before flowing back into Straight Creek. The *clean water diversion* project will help improve water quality and provide a more efficient method of controlling highway flows.

Another CWA Section 319 grant project, the ***I-70 Snow Slide Structural BMP above Straight Creek***, was approved in 2004. This project will be constructed at the Tunnel parking area, located next to the west portal along Eastbound I-70. The town of Dillon and the Colorado Department of Transportation (CDOT) are providing the match funding for this \$287,800 project. Located at an elevation of 11,000 feet, large amounts of snow accumulate in the parking area over the winter. When this snow melts in the spring, the sand material that has accumulated over the winter is carried off-site. The project involves construction of a concrete pad, hence the term “*snow slide*,” that will be constructed along the fill slope. A concrete barrier will be positioned at the top of the *snow slide* that will include an opening, allowing plow drivers to push the accumulated snow down onto the *snow slide*. Just below the *snow slide*, a concrete valley pan will be constructed, along with a sediment basin, to collect the accumulated sediment material. This material will be removed and disposed of by CDOT Maintenance forces during the summer months. It is estimated that approximately 50-100 tons of sand material will be captured annually by this BMP.

The projects described above include monitoring and evaluation plans, a public information component, and a potential technology transfer benefit. As these BMPs are implemented along the Straight Creek corridor, sediment loading will be reduced, resulting in improved water quality, stream health and overall watershed improvements.

A great deal of thanks go to EPA Region 8, the State’s Nonpoint Source Council and the Water Quality Control Division at the Colorado Department of Public Health & Environment for their continued support of these innovative BMP projects. For additional information on these and other projects planned for the Straight Creek corridor please contact **Terri Tiehen**, CDOT, 303-757-9285, or

Theresa.Tiehen@DOT.State.CO.US.

Funding Opportunities

EPA STAR Grants—Environmental Information.

EPA, as part of its Science to Achieve Results (STAR) program, is seeking applications for research projects to address issues associated with the disclosure of environmental information. This research will help understanding of how required disclosure of environmental information about contaminants in drinking water, toxic releases or residues, chemical or oil spills, emissions, discharges and waste storage and disposal influences environmental behavior, practices, and performance by communities, regulatory and enforcement agencies, facilities and other organizations.

Institutions of higher education and not-for-profit institutions located in the U.S., and tribal, state and local governments, are eligible to apply. EPA expects to make up to 6 awards for about \$1.5 million for 3 years of research. The deadline for submitting proposals for these research grants is **April 13, 2005**.

For more information on this request for applications, see: http://es.epa.gov/ncer/rfa/2005/2005_ebd_rfa.html. For more information about the EPA STAR program, visit: <http://es.epa.gov/ncer/>.

EPA STAR Grants—Climate Change and Human Health.

EPA, as part of its Science to Achieve Results (STAR) grants program, is seeking applications for research projects to determine the potential consequences of climate change and climate variability on human health. Institutions of higher education and not-for-profit institutions located in the United States, and tribal, state and local governments, are eligible to apply for the grants totaling approximately \$5.1 million. The deadline for submitting proposals for these research grants is **March 29, 2005**. For more information on this request for applications, see: http://www.epa.gov/ncer/rfa/2005/2005_decision_support_sys.html.

and http://www.epa.gov/ncer/rfa/2005/2005_hsa_impacts_research.html.

For more information on EPA's Science to Achieve Results (STAR) research grants program in the National Center for Environmental Research, visit: <http://es.epa.gov/ncer/> or contact: Ann Brown, 919-541-7818, brown.ann@epa.gov

Publications and Web Resources

Model Landscaping Ordinance and BMPs from Colorado

The Department of Local Affairs, Office of Smart Growth has made available a new water-efficient model landscaping ordinance and best practices manual. The ordinance and manual are available on the Office's Web site at: <http://www.dola.state.co.us/smartgrowth/documents/>

Paper on "Water and Smart Growth: The Impacts of Sprawl on Aquatic Ecosystems" by the Funders' Network

This is a translation paper from the Funders' Network for Smart Growth and Livable Communities describing how sprawl has become the second largest and fastest growing source of pollution to our nation's water system, and how land use reform can help protect our watersheds. The paper can be viewed at: [http://www.fundersnetwork.org/usr/doc/Water and Smart Growth Final.pdf](http://www.fundersnetwork.org/usr/doc/Water%20and%20Smart%20Growth%20Final.pdf)

EPA Offers Communities a New Tool for Achieving Smart Growth and Water Quality Goals

EPA has released a new report that will help communities protect water resources and achieve smart growth. Some of the adverse effects of growth and development include: loss of woodlands, meadowlands, and wetlands, and increased polluted run-off. The report documents 75 innovative approaches that state and local governments and water quality professionals can use to achieve their smart growth and water quality goals. To receive a free copy of the report, send an email to: ncepimal@one.net or call 1-800-490-9198 and request EPA publication 231-R-04-002. The report and more information about smart growth are also available at: <http://www.epa.gov/smartgrowth>

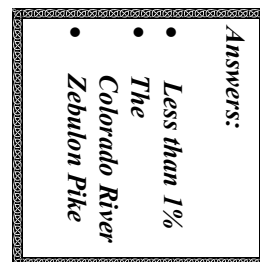
COOL WATER FACTS

For answers to these questions, visit <http://waterknowledge.colostate.edu/coolfact.htm>, or see below.

What percent of the water treated by public water systems is used for drinking and cooking?

What river in Colorado used to be called the Grand River?

Who was the American explorer who compared the western plains to the sandy deserts of Africa?



"Real freedom lies in wilderness, not in civilization."

~ Charles A. Lindbergh

New Smart Growth Newsletter

To learn more about the Smart Growth Network, go to <http://www.smartgrowth.org/>. To download a sample issue of Getting Smart! just visit <http://www.smartgrowth.org/sgn/join.asp>.

12 Federal Agencies Collaborate to Create Science Portal

The Department of Energy recently launched Science.gov 2.0, the next major step in government science information retrieval. Science.gov is made possible through the collaboration of 12 major science agencies, including EPA. Visit <http://www.science.gov>

Linking Girls to the Land Initiative—New Resources Available

For the past 10 years, EPA has been a partner with other federal agencies to encourage hands-on conservation activities for Girl Scouts. A new Resources Guide provides step-by-step instructions on how to conduct an environmental project and describes some of the environmental programs that the partners can offer. You can find additional information about these and other partner resources on the new *Linking Girls to the Land* Web site at: <http://www.epa.gov/linkinggirls>

Citizen's Agenda for Rivers The Citizens' Agenda for Rivers is a proactive plan created by and for the nationwide river movement. It identifies three priority threats to rivers: 1) the erosion of clean water protections; 2) not enough water to sustain healthy rivers; and 3) the paving over and pollution of watersheds by sprawl. For each threat, the Agenda identifies practical policy solutions that can be implemented today at the local, state, and federal level. You can learn more about the Citizens' Agenda for Rivers and related efforts online at: <http://www.healthyrivers.org>

Conferences/Training

National River Rally 2005

River and watershed leaders from around the country will gather for the sixth annual National River Rally, sponsored by River Network. It will be held May 20—24 at the Keystone Resort in Colorado. The Rally is a comprehensive national conference for those working to understand, restore and protect rivers and watersheds. Staff, volunteers and board

members of all experience levels are encouraged to participate. Nearly 100 workshops will cover emerging policy issues, fundraising, technical issues, watershed science, hands-on watershed protection skills, and much more. There will be dozens of concurrent workshops, many field trips and limitless networking opportunities. General registration for staff and board members of River Network Partner organizations is \$625, including four nights of lodgings, shuttles from the Denver airport, and most meals. Scholarships will be available. **Requests for scholarships should be made when registering, and must be submitted by March 18th.** Group discounts are available for non-profit groups sending three or more people. To register and to get detailed information on the Rally, check out <http://www.rivernetwork.org/rally>

To get additional answers to registration questions, contact riverrally@rivernetwork.org

Teaching Outside the Box—Creative uses of Nature in Education.

April 29—May 1 in Granby, Colorado. Offers an opportunity to share activities, experiences and wisdom with others who strive to include nature in their teaching. Sponsored by Colorado Alliance for Environmental Education. See <http://www.cace.org/outside.htm>

2005 Brownfields Conference, Denver, CO.

Save the Date! The 2005 Brownfields Conference is November 2-4, 2005 at the Colorado Convention Center. It is sponsored by USEPA and the International City/County Managers Association (ICMA). EPA Region 8 will be featuring some of the unique environmental issues facing the West including Tribal Brownfields, mining sites, watershed issues, and rural community issues.

There are multiple networking opportunities at this conference. Over one hundred educational sessions and two hundred exhibits aim to solutions to Brownfields redevelopment challenges. A new "Transaction Forum" sponsored by ICMA was a highlight of last year's event. This event brought together "dealmakers" such as communities, property owners, developers, and real estate people in order to facilitate redevelopment opportunities/transactions right at the conference.

For more information check out the website at www.brownfields2005.org, or contact Robin Coursen at coursen.robin@epa.gov.

effective approaches for diagnosing urban lake impairments, as well as strategies for urban lake enhancement that can be initiated by state and local governments, environmental advocacy groups, and community residents. Visit <http://www.nalms.org/symposia/chicago/index.htm> for full program and registration information.



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Natural News

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If you have an article concerning ecosystem protection, community based environmental protection, or watersheds, we would like to hear from you!

We need your help in updating our mailing list in order to keep Natural News coming to you! Please contact John DiPentino at (303) 312-6594 or dipentino.john@epa.gov, or write to him at the return address below.

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